BAKBARDIN, Yu.V. (Kiyev)

Treatment of primary tumors of the iris. Vest. oft. 71 no.2:44-46
(IRIS, neoplasms (MIRA 11:4)
ther. of primary tumors)

BAKBARDIN, Yu.V.

Use of carbon dioxide snow to form an adhesive inflammation of eye tissues. Oft.zhur. 16 no.6:334-336 '61. (MIRA 14:11)

1. Iz kafedry oftal'mologii (nachal'nik - prof. B.L. Polyak) Voyenno-meditsinskoy ordena Lenina akademii imeni S.M. Kirova.
(DRY ICE--THERAPEUTIC USE) (RETINA--DISEASES)

BAKBARDIN, Yu.V., polkovnik med.sluzhby

Use of lytic mixtures in ophthalmic surgery. Sbor.nauch.trud. Kiev.okruzh.voen.gosp. no.4:333-334 '62. (MIRA 16:5)
(ANESTHESIA) (EYE—SURGERY)

TAKTAROV, Yu. V., FILIPPENKO, V. I., ZHIL'BERMAN, B. I. and [illegible], Ya. [illegible]

"On Eye Injuries".

Voyenno Meditsinskiy Zhurnal, No.4, 1962

BAKBARDIN, Yu.V. (Kiyev)

Lymphogranulomatosis with primary localization in the orbits.
Vrach. delo no.9:150-152 '63. (MIRA 16:10)
(HODGKIN' DISEASE) (ORBIT (EYE) — DISEASES)

APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000103110002-3"

BYALIK, V.I.; [illegible], F.G.; BARBARDIN, Yu.V. (Kiyev)

Morphology of changes in the eye in acute leukemia. Arkh. pat. 24 no.11:55-57 '62. (MIRA 15:12)

1. Iz kafedry patologicheskoy anatomii (zav. - zasluzhennyy deyatel' nauki prof. M.K.Dal') Kiyevskogo instituta usovershenstvovaniya vrachey (rektor - dotsent M.N.[illegible]).

BAKBERGENOV, S.

[Beacons; a collection of essays about heroes of the seven-year plan] Maiaki; sbornik ocherkov o geroiakh semiletki. Alma-Ata, Kazgoslitizdat, 1962. 284 p. (MIRA 16:11)

(Kazakhstan--Economic conditions)

SARDI, Gyorgy, okleveles gepeszmernok; BAKCSI, Robert, okleveles gepeszmernok

Air injection channels of passenger spaces in motor trains. Epuletgepeszet 12 no.5:161-164 O '63.

1. Ganz-MAVAG Vagonszerkesztes.

BAKCSI, Robert, oklevelos gepeszmernok; SARPI, Gyorgy, oklevelos gepeszmernok

Air ducts of the passenger room of motor trains. Jarmu mezo gep 12 no.4:121-126 Ap '65.

Bakel'man, I. Ya. Smooth surfaces of bounded curvature. Doklady Akad. Nauk SSSR (N.S.) 82, 501-504 (1952). (Russian)

Let $z=f(x, y)$ be defined in a square Q and have continuous first derivatives. Let P be a polygonal region in Q, and $\Delta_1, \cdots, \Delta_k$ the triangles of a triangulation T of P. Denote

[illegible]

area of P. Put $\mu_r(P) = \sup_T \mu(T)$ and $\mu(P) = \lim \mu_r(P)$. If G is an open subset of Q, then the μ-curvature of G is the number $\mu_0(G) = \sup \sum \mu(P_i)$, where $(P_1, \cdots, P_k)$ traverses all sets of non-overlapping polygons in the projection G' of G in Q. If $\sup_{G \subset F} \mu_0(G) < \infty$ then F is said to have bounded [illegible] curvature; thus a term like μ-curvature is advisable.)

Every surface of bounded μ-curvature is a surface of bounded curvature in the sense of A. D. Alexandrov. A surface F of class C' has bounded μ-curvature, if and only if it can be approximated together with its derivatives by a sequence of regular surfaces F_n for which the integrals $\iint [x^2_{n1}(x) + x^2_{n2}(x)] dS$, are uniformly bounded; here $x_{ni}(x)$

[illegible] given to show the usefulness of the concept.

H. Busemann (Auckland)

Source: Mathematical Reviews, Vol 13 No. 10

~~BAKEL'MAN, I. Ya.~~

Dissertation: "Smooth Surfaces With Generalized Second Derivatives." Cand Phys-Math Sci, Leningrad State U, Leningrad, 1954. Referativnyy Zhurnal--Matematika, Moscow, Jul 54.

SO: SUM No. 356, 25 Jan 1955

BAKEL'MAN, I. YA.

USSR. I-F/W

62

Bakel'man, I. Ya. Determination of a smooth surface by first and generalized second quadratic forms. Uspehi Mat. Nauk (N.S.) 9, no. 4(62), 155–162 (1954). (Russian)

Let D be a domain in a (u, v)-plane bounded by a simple closed polygon. Consider the class W of all surfaces in E^3 given by position vectors $\mathbf{r}(u, v)$ defined in D, where $\mathbf{r}(u, v)$ is of class C^1, $|\mathbf{r}_u \times \mathbf{r}_v| > 0$, and all generalised second partial derivatives of $\mathbf{r}(u, v)$ in the sense of Sobolev exist. Let E, F, G, L, M, N be defined in the usual way, where, for instance, $\mathbf{r}_{uu}$ in $L = |\mathbf{r}_{uu}, \mathbf{r}_u, \mathbf{r}_v|$ stands for a generalized derivative. If for two surfaces in W a one-to-one correspondence between their points exists such that the values of E, F, G, L, M, N at corresponding points are equal almost everywhere in D, then the two surfaces are congruent as sets in E^3.

H. Busemann (Paris).

BAKEL'MAN, I.Ya.

Plane surfaces with generalized second derivatives. Dokl.AN SSSR 94 no.4:605-608 F '54. (MLRA 7:2)

1. Leningradskiy tekhnologicheskiy institut im. V.M.Molotova. (Surfaces)

Card Nr. AF

Transactions of the Third All-union Mathematical Congress, Moscow, Jun-Jul '56, Trudy '56, V. 1, Sect. Rpts., Izdatel'stvo AN SSSR, Moscow, 1956, 237 pp.

Bakel'man, I. Ya. (Leningrad) Evaluation Deformation of a Convex Surface. 138

BAKEL'MAN, I.Ya.; VERNER, A.L.

Generalized derivatives of continuous functions with two variables.
Usp.mat.nauk 11 no.1:173-179 Ja-F '56. (MLRA 9:6)
(Functions, Continuous)

BAKEL'MAN, I-Ya

SUBJECT	USSR/MATHEMATICS/Geometry	CARD 1/2	PG - 460
AUTHOR	BAKEL'MAN I.Ja.		
TITLE	Differential geometry of smooth irregular surfaces.		
PERIODICAL	Uspechi mat.Nauk 11, 2, 67-124 (1956) reviewed 12/1956		

The author shows that most of the results of the classical differential geometry can be transferred to surfaces which are described by functions which possess continuous first derivatives and second derivatives generalized in the sense of Sobolev. Here it is assumed that the latter ones in the considered regions of surfaces are summable with square. The author asserts that these irregular surfaces, according to their inner geometry, belong to the class of two-dimensional manifolds of bounded curvature due to Alexandrov.

The paper contains a connected representation of the differential geometry of the mentioned surfaces. The first chapter brings definitions and properties of generalized derivatives of vector functions as well as necessary and sufficient conditions therefore that a smooth surface $z = f(x,y)$ possesses quadratically summable generalized second derivatives inside of a square D. In the second chapter inner-geometric properties of the surfaces are treated. It is asserted that the metric of the considered surfaces possesses a bounded curvature and that to the notions of the inner curvature and the variation (according to Alexandrov) in this case there corresponds the integral of

Uspechi mat. Nauk 11, 2, 67-124 (1956) CARD 2/2 PG - 468

Gaussian curvature with respect to the area and the integral of the geodesic curvature with respect to the arc length. The third chapter brings the connection betwedn the inner metric of the surface and its form in the space. Peterson-Kodazzi's formulas and the theorem of Gauß on the equality of the area of the spherical image and the inner curvature are generalized. Criteria are given for the sign of the curvature of the inner metric. It is shown that the considered surfaces are determined uniquely by their first and generalized second quadratic forms.

SUBJECT	USSR/MATHEMATICS/Geometry CARD 1/1 PG - 339
AUTHOR	BAKELMANN I.Ja.
TITLE	The estimation of the deformations of regular convex surfaces in dependence of the change of their inner metric.
PERIODICAL	Doklady Akad. Nauk 10?, 358-361 (1956) reviewed 10/1956

Let Φ_0 and Φ be regular closed convex surfaces with essentially positive Gaussian curvature. Let consist between the points Φ_0 and Φ a one-to-one correspondence, where in corresponding points the fundamental terms of first order and their first and second derivatives for both surfaces differ little from eachother. What then can be said about the deviation of their derivatives ? This question is answered by the author by two theorems, one of which treats the closed surfaces and the other treats surfaces with bounds. In both cases from the in a certain sense small deviation of the fundamental terms and the Gaussian curvature a small deviation of the position vectors and of the spherical coordinates (in the case of a closed surface) respectively, is obtained. The proofs base on properties of the solutions of non-linear elliptic differential equations. A former result of Schauder (Math.Ann. 106, 661 (1932)) is used for somewhat weakened assumptions.

INSTITUTION: Educational Institute, Leningrad.

APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000103110002-3"

SUBJECT USSR/MATHEMATICS/Geometry CARD 1/2 PG - 729
AUTHOR BAKEL'MAN I.Ja.
TITLE Differential geometry of smooth manifolds.
PERIODICAL Uspechi mat.Nauk 12, 1. 145-146 (1957)
reviewed 5/1957

A surface is called smooth if in the neighborhood of each of its points it permits the parameter representation $\mathfrak{r} = \mathfrak{r}(u,v)$, where $\mathfrak{r}(u,v)$ is continuously differentiable and $|\mathfrak{r}_u \times \mathfrak{r}_v| \neq 0$. The author considers the question of the imbedding of smooth surfaces into the euclidean space. It is assumed that $\mathfrak{r}(u,v)$ beside of the mentioned properties has generalized second derivatives in the sense of Sobolev which in the neighborhood of each point are summable in the square. This enables the author to introduce a second generalized differential form according to the model of the classical differential geometry. In certain points this may not exist and its coefficients may be discontinuous and become infinitely large. All fundamental properties of the regular surfaces can be transferred to the considered irregular surfaces. Most of the relations appear only by replacing the usual derivatives by the generalized ones.

From the point of view of the inner metric the considered surfaces are manifolds of bounded curvature in the sense of Alexandrow. Almost all coordinate lines possess a bounded integral curvature in the space, consequently an integral geodesic curvature for which the formulas of the classical

Uspechi mat Nauk 12, 1, 145 146 (1957) CARD 2/2 PG - 729

differential geometry are valid if the ordinary derivatives are replaced by generalized ones. The considered surfaces admit an approximation by regular surfaces, where the inner metric of the approximating surfaces converges uniformly to the inner metric of the approximated surface.

20-114-6-1/54

AUTHOR: Bakel'man, I. Ya.

TITLE: A Generalization of the Solution of the Monge-Ampère Equations (Obobshchennyye resheniya uravneniy Monzha-Ampera)

PERIODICAL: Doklady Akademii Nauk SSSR,1957,Vol.114,Nr 6,pp.1143-1145(USSR)

ABSTRACT: The author examines the Monge-Ampère equation $rt - s^2 = \varphi(x,y) R(p,q)$ within a certain convex domain D on the area (x,y). $\varphi(x,y) > 0$ and $R(p,q) \geqslant R_o$ = const > 0 are here constant functions, the former within the closed domain D and the latter on the p,q - plain. As generalized solution of the Monge-Ampère equation the author designates a function z(x,y) which defines the convex surface Φ for which on any inner subdomain M of D the equation

$$\iint\limits_M \varphi(x,y)dxdy = \iint\limits_{\psi(M)} \frac{dp\ \ dq}{R(p,q)} = \omega_R(M)$$ is satisfied. The

Card 1/2 problem of the determination of the convex surface with the

20-114-6-1/54

A Generalization of the Solution of the Monge-Ampère Equations

assumed R-plain of the normal graph is best treated by imposing a limiting condition to the surface. The present paper examines two types of such limiting conditions. First infinite convex surfaces are investigated. Then the Dirichlet problem is formulated in the generalized representation. The here obtained theorems can be applied to functions of n variables ($n \geq 2$).
Altogether 7 theorems are given. There are 2 references, 2 of which are Slavic.

ASSOCIATION: Leningrad Pedagogical Institute imeni A. I. Gertsen (Leningradskiy pedagogicheskiy institut im. A. I. Gertsena)

PRESENTED: December 10, 1956, by V. I. Smirnov, Member of the Academy

SUBMITTED: December 6, 1956

Card 2/2

AUTHOR: BAKEL'MAN I. Ya. 20-5-1/48

TITLE: Apriori-Estimations and Regularity of the Generalized Solutions of the Equations of Monge-Ampere (Apriornyye otsenki u regulyarnost' obobshchennykh resheniy uravneniy Monzha-Ampera)

PERIODICAL: Doklad. Akad. Nauk SSSR, 1957, Vol.116, Nr 5, pp. 719-722 (USSR)

ABSTRACT: The author considers the partial differential equation

(1) $rt - s^2 = \varphi(x,y,z,p,q)$,

where $\varphi(x,y,z,p,q) \geqslant K_0 > 0$ is an m times differentiable function ($m \geqslant 3$). Under very numerous assumptions on the function φ and on the solution $z(x,y)$ the author gives explicit estimations for $\max |z|$ and $\max(\mathrm{grad}^2 z)$. Furthermore the author formulates a theorem which asserts that the $|r|$, $|s|$ and $|t|$ in a closed domain can be estimated by the upper bounds of $|\varphi|$, $\left|\frac{\partial\varphi}{\partial x}\right|, \ldots, \left|\frac{\partial^2\varphi}{\partial q^2}\right|$ and by $\psi(\theta)$, $\psi^{(k)}(\theta)$ $(k = 1,2,3,4)$. Here θ is the polar angle and $\psi(\theta)$ is that function in which $z(x,y)$ changes on the

Card 1/2

Apriori-Estimations and Regularity of the Generalized Solutions 20-5-1/48
of the Equations of Monge-Ampere

boundary of the domain. The obtained estimations are used in order to show the regularity of the generalized solution of (1). Two Soviet and 1 foreign references are quoted.

PRESENTED: By V. I. Smirnov, Academician, April 26, 1957

ASSOCIATION: Leningrad State Pedagogical Institute (Leningradskiy gosudarstvennyy pedagogicheskiy institut)

SUBMITTED: April 24, 1957

AVAILABLE: Library of Congress

Card 2/2

AUTHOR: BAKEL'MAN, I.Ya. 43-1-2/10

TITLE: On the Theory of the Monge-Ampère Equation (K teorii uravneniy Monzha-Ampera)

PERIODICAL: Vestnik Leningradskogo Universiteta, Seriya Matematiki, Mekhaniki i Astronomii, 1958, Nr. 1(1), pp. 25-38 (USSR)

ABSTRACT: In the equation

$$(1) \qquad r\,t - s^2 = \varphi(x,y) \cdot R\,(p,q)$$

$\varphi(x,y) > 0$ is assumed to be continuous in D and $R(p,q) > R_0 = \text{const} > 0$ to be continuous in the whole p,q-plane. $z(x,y)$ is assumed to be a twice continuously differentiable solution of (1). Then the surface $\Phi\,(z = z\,(x,y))$ is convex and has only one common point with each supporting plane. The mapping $\psi(p = z_x\,;\ q = z_y)$ of D into the p,q-plane is one-to-one continuously differentiable, and for each Borel set $M \subset D$ it holds

$$\iint_M \frac{r\,t - s^2}{R(p,q)}\, dx\, dy = \iint_{\psi(M)} \frac{dp\, dq}{R(p,q)}$$

Since $z(x,y)$ satisfies (1), it holds

Card 1/3

$$(2) \quad \iint_M \varphi(x,y)\, dx\, dy = \iint_{\psi(M)} \frac{dp\, dq}{R(p,q)}$$

too. $\iint_M \varphi(x,y)dx\, dy$ is a countably additive nonnegative set function $\mu(M)$ on the Borel sets M of the domain D, while $\iint_{\psi(M)} \frac{dp\, dq}{R(p,q)}$ is a certain set function on Φ. It is denoted as the R-surface of the normal mapping of Φ, in symbols: $\omega_R(M,\Phi)$. (2) allows to understand the integration of (1) as the determination of a convex surface Φ, the R-surface of which is a given countably additive nonnegative function $\mu(M)$ on the ring of the Borel sets of D. The generalized solutions of (1) are sought among the general convex surfaces, the R-surface of which is a given set function $\mu(M)$. By this set up the author succeeds in applying the direct methods of A.D. Aleksandrov [Ref.1] [Ref. 2] for the solution of the boundary value problems for (1). For summable $\varphi(x,y)$ the author proves with these methods the solubility of the correspondingly defined Dirichlet problem for (1) and the uniqueness of the solution in the class of the convex functions. 10 theorems are proved on the whole. 4 Soviet references are quoted.

SUBMITTED: 28 December 1956

AVAILABLE: Library of Congress

1. Conformal mapping 2. Functions 3. Monge-Ampere equation-Theory

APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000103110002-3"

AUTHORS: ~~Bakel'man, I.Ya.~~ Birman, M.Sh., and Ladyzhenskaya, O.A. SOV/42-13-5-11/15

TITLE: Solomon Grigor'yevich Mikhlin (on the Occasion of his 50th Birthday) (Solomon Grigor'yevich Mikhlin (K pyatidesyatiletiyu so dnya rozhdeniya))

PERIODICAL: Uspekhi matematicheskikh nauk, 1958, Vol 13, Nr 5, pp 215-222 (USSR)

ABSTRACT: This is a short biography and a summary of the scientific activity of S.G. Mikhlin with a list of his publications (1932-1957) containing 78 papers. There is a photo of Mikhlin.

Card 1/1

AUTHOR: Bakel'man, I.Ya. (Leningrad) 20-119-4-1/59

TITLE: Irregular Surfaces of Bounded Exterior Curvature (Neregulyarnyye poverkhnosti ogranichennoy vneshney krivizny)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol 119, Nr 4, pp 631-632 (USSR)

ABSTRACT: The author considers the following problem set up by A.D. Aleksandrov: The class of surfaces with internal metric of bounded curvature is to be determined which contains the following subclasses: 1. Smooth surfaces of bounded external curvature, 2. general convex surfaces and surfaces which are representable by differences of two convex functions.
For this purpose the author considers surfaces F which satisfy the following demands: 1. In each point X of F the contingence of the surface forms a cone $K_F(X)$, the contact cone in X. Let the sequence $\{X_i\}$ converge on F to $X_o \in F$, let $\{P_i\}$ be the sequence of the contact planes on the cones $K_F(X_1)$, $K_F(X_2)$,... . The limit plane P_o is the contact plane of $K_F(X_o)$ 2. Each point $X \in F$ has a neighborhood U which is representable by

Card 1/3

$z = f(x,y)$ under suitable choice of the coordinates, where the contact cones possess no contact planes in the points of U which are orthogonal to the x,y-plane. If for such a surface the positive part of the external curvature is bounded, then the author denotes these surfaces "surfaces of bounded external curvature". The class of these surfaces corresponds to the demands of the problem set up. There hold the following theorems:

Theorem: Each point X of a surface F of bounded external curvature possesses a neighborhood $U \subset F$ so that there exists a sequence of regular surfaces F_n with the following properties 1. F_n and their internal metrics converge on U to F, 2. The positive parts of the external curvatures $\iint K_n d S_n$ are uniformly bounded. There E_n is the set of the points of the F_n, where the Gauss curvature is $K_n \geqslant 0$, $d S_n$ the surface element of F_n.

Theorem: The surfaces of bounded external curvature are manifolds of bounded curvature in the sense of A.D. Aleksandrov with regard to their internal metrics. There are 4 Soviet references.

Irregular Surfaces of Bounded Exterior Curvature 20-119-4-1/59

ASSOCIATION: Leningradskiy gosudarstvennyy pedagogicheskiy institut imeni A.I. Gertsena (Leningrad State Pedagogical Institute imeni A.I. Gertsen)

PRESENTED: November 18, 1957, by V.I. Smirnov, Academician

SUBMITTED: November 15, 1957

Card 3/3

AUTHOR: Bakel'man, I.Ya. SOV/20-123-2-1 59

TITLE: Definition of a Convex Surface by a Given Function of its Principal Curvatures (Opredeleniye vypukloy poverkhnosti dannoy funktsiyey yeye glavnykh krivizn)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 2, pp 215-218 (USSR)

ABSTRACT: The author investigates the existence of a convex surface F the principal curvatures K_1 and K_2 of which satisfy the condition

$$(1) \quad f(x,y,z,p,q)K_1K_2 - \varphi(x,y,p,q)(K_1+K_2) = \psi(x,y)$$

or

$$(2) \quad f(x,y,z,p,q)K_1K_2 - \varphi(x,y,p,q)\sqrt{f(x,y,z,p,q)}(K_1+K_2) = \psi(x,y),$$

where f and φ in x and y are continuous in the convex domain D, $f>0$, $\varphi>0$ and $\psi(x,y)$ is summable in D.
The author introduces the notion of a generalized solution of the differential equation (1) and (2), respectively, and it is shown that under certain conditions there exist such generalized solutions which satisfy (1) and (2), respectively, almost everywhere. The author uses essentially the investigations of Aleksandrov /Ref 1,4/ and own results /Ref 2,3/.
There are 4 Soviet references.

Card 1/2

Definition of a Convex Surface by a Given Function of ... Principal Curvatures

ASSOCIATION: Leningradskiy gosudarstvennyy pedagogicheskiy institut ... A.I.Gertsena (Leningrad State Pedagogical Institute ... A.I.Gertsen)

PRESENTED: May 30, 1958, by V.I.Smirnov, Academician

SUBMITTED: May 28, 1958

Card 2/2

BAKEL'MAN, I.Ya.

First boundary value problem for some nonlinear elliptic equations and its application to geometry. Uch. zap. Ped. inst. Gerts. 183:199-216 '58. (MIRA 13:8)
(Differential equations, Partial)

BAKEL'MAN, I. Ya., Doc Phys-Math Sci -- (diss) "First boundary ~~mar-~~ ~~ginal~~ problem for non-linear elliptic equations." Leningrad, 1959. 17 pp (Len State Pedagogical Inst im A.I. Gertsen). 150 copies. Bibliography at end of text (13 titles)

(KL, 39-59, 100)

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APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000103110002-3"

16(1)

AUTHOR: Bakel'man, I.Ya. SOV/20-124-2-1/71

TITLE: The First Boundary Value Problem for Some Non-Linear Elliptic Equations (Pervaya krayevaya zadacha dlya nekotorykh nelineynykh ellipticheskikh uravneniy)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 2, pp 249-252 (USSR)

ABSTRACT: The author considers the first boundary value problem for the equation

$$(1) \qquad F(r,s,t,x,y) = g(x,y)$$

in the circle D: $x^2 + y^2 \leqslant R^2$. F is a polynomial of odd order in r,s,t with coefficients three times differentiable in D; $F(0,0,0,x,y) \equiv 0$ for all $(x,y) \in D$. The function $g(x,y)$ is three times differentiable. For all real ξ and η and arbitrary $u(x,y) \in C^{(2)}(D)$ we have

$$\frac{\partial F}{\partial r}\xi^2 + \frac{\partial F}{\partial s}\xi\eta + \frac{\partial F}{\partial t}\eta^2 \geqslant \alpha_0(\xi^2 + \eta^2), \qquad \alpha_0 = \text{const} > 0.$$

After the introduction of polar coordinates the transformed left side of the equation has to satisfy a further (decisive) postulate. If all assumptions are satisfied, then there holds the theorem:

Card 1/2

The First Boundary Value Problem for Some Non-Linear Elliptic Equations SOV/20-124-2-1/71

To every function $\varphi(\theta) \in C^{(5)}[0,2\pi]$ there exists a single function $z(x,y) \in C^{(4)}(D)$ satisfying the equation (1) in D and changing into $\varphi(\theta)$ on the boundary.
An analogous theorem is valid if D is a convex domain, the boundary of which has a curvature $> \varkappa_0$ = const > 0. Some geometrical applications of the obtained results are given.
There are 4 references, 2 of which are Soviet, 1 American, and 1 German.

ASSOCIATION: Leningradskiy gosudarstvennyy pedagogicheskiy institut imeni A.I.Gertsena (Leningrad State Pedagogical Institute imeni A.I.Gertsen)

PRESENTED: September 2, 1958, by V.I.Smirnov, Academician

SUBMITTED: August 25, 1958

Card 2/2

16(1)

SOV/20-126-2-5/64

AUTHOR: Bakel'man, I. Ya.

TITLE: On a Class of Nonlinear Differential Equations

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 2, pp 244-247 (USSR)

ABSTRACT: The author introduces totally elliptic operators F(u), e.g. $u_{11}^3+\dots+u_{nn}^3+u_{11}+\dots u_{nn}$, where $u_{ik} = \partial^2 u/\partial x_i \partial x_k$, and investigates the totally elliptic equations F(u) = 0. For F(u) he defines a norm $\mu(F)$, where the results of O.A.Ladyzhenskaya are used, and it is shown that if $\mu(F) < \sqrt{2}/\sqrt{n^2+3n+2}$, where n denotes the number of independent variables, then the Dirichlet problem for F(a) = 0 is uniquely solvable in the class $\overset{0}{W}{}_2^{(2)}$. For the norm of the solution the author gives an estimation. Then similar results are obtained for special nonlinear differential operators.

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On a Class of Nonlinear Differential Equations SOV/20-126-2-5/64

not elliptic for every function of the considered class. Under very numerous assumptions the author formulates three theorems. He mentions A.I.Koshelev.
There are 3 Soviet references.

ASSOCIATION: Leningradskiy gosudarstvennyy pedagogicheskiy institut imeni A.I. Gertsena (Leningrad State Pedagogical Institute imeni A.I. Gertsen)

PRESENTED: January 24, 1959, by V.I.Smirnov, Academician

SUBMITTED: January 23, 1959

Card 2/2

16(1)

AUTHOR: Bakel'man, I.Ya. SOV/20-126-5-2/69

TITLE: The Dirichlet Problem for Monge-Ampère Equations and Their n-Dimensional Analogues

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 5, pp 923-926 (USSR)

ABSTRACT: Let the equation

(1)

$$\Gamma(z) - \sum_{i,k=1}^{n} A_{ik}(x_1, x_2, \ldots, x_n, z, p_1, \ldots, p_n) \frac{\partial^2 z}{\partial x_i \partial x_k} - E(x_1, \ldots, x_n, z, p_1, \ldots, p_n) = 0$$

be considered in the n-dimensional domain D, where $\Gamma(z)$ is the Hessian of $z(x_1, \ldots, x_n)$, $p_i = \frac{\partial z}{\partial x_i}$, A_{ik}, E is continuous for all finite z, $p_1, \ldots, p_n$ and all $(x_1, \ldots, x_n) \in D + \Gamma$, where Γ is the convex boundary of D. Furthermore let be $\sum_{i,k=1}^{n} A_{ik} \xi_i \xi_k \geqslant 0$ for all z, p_i and $(x_1, \ldots, x_n) \in D + \Gamma$

and $M \geq 0$. Furthermore let be $M \leq \varphi(x_1,\dots,x_n) \cdot R(p_1,\dots,p_n)$, where $\varphi \geq 0$ is summable in D and $R \geq R_0$ = const > 0 is continuous. The author writes (1) in the form

$$(2) \qquad \Phi(z) = \frac{\Gamma(z)}{R(p_1,\dots,p_n)} - M(z) - N(z) = 0$$

where $M = \frac{1}{R}\sum A_{ik}\frac{\partial^2 z}{\partial x_i \partial x_k}$, $N = \frac{M}{R}$ and uses the fact be stated in [Ref 1] that a completely additive nonnegative set function $\omega_R(z,e)$ corresponds to the operator $\frac{\Gamma(z)}{R(p_1,\dots,p_n)}$ for $z \in W(D)$, where $W(D)$ is the class of the convex functions, in order to define for (2) a generalized solution in $W(D)$. If then $W_\Gamma(D)$ is the set of those $z \in W(D)$ vanishing on Γ, then the Dirichlet problem for (2) consists in the determ-

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ination of a solution of (2) in the class $W_p(D)$.

Theorem: Let the coefficients of (2) for all finite z, p_k and $(x_1,\dots,x_n) \in D + \Gamma$ satisfy the condition

$$\frac{1}{R} \sum_{i,k=1}^{n} A_{ik} \eta_i \eta_k \leqslant \frac{1}{\sum_{i,k=1}^{n} Q_k(p_k)} \sum_{i=1}^{n} \eta_i^2$$

where η_j are arbitrary real numbers, and $Q_k(p_k)$ certain continuous positive functions. Furthermore let be

$$\int_D \cdots \int \varphi(x_1,\dots,x_n)\,dx_1 \dots dx_n + \left[d(D)\right]^{n-1} \sum_{k=1}^{n} \Omega(Q_k) < +\infty$$

$$R(p_1,\dots,p_n) \leqslant C\left(1 + \sum_{i=1}^{n} p_i^2\right)^{1/2}, \quad C = \text{const} > 0 .$$

Then the Dirichlet problem for (2) is solvable in the generalized sense defined above. The generalized solution satisfies (2) almost everywhere. Here d(D) denotes the diameter of D and it is

$$\Omega(Q_k) = \int_{-\infty}^{\infty} \frac{dp_k}{Q_k(p_k)}$$

There are 3 Soviet references.

ASSOCIATION: Leningradskiy pedagogicheskiy institut imeni A.I. Gertsena (Leningrad Pedagogical Institute imeni A.I. Gertsen)

PRESENTED: February 28, 1959, by V.I. Smirnov, Academician
SUBMITTED: February 25, 1959

22858

16.3500

S/044/60/000/012/002/014
C 111/ C 333

AUTHOR: Bakel'man, I. Ya.

TITLE: The first boundary value problem for some nonlinear equations of elliptic type and its applications in geometry. Part I.

PERIODICAL: Referativnyy zhurnal, Matematika, no. 12, 1960, 78, abstract 13853. (Uch. zap. Leningr. gos. ped. in-ta im. A. J. Gertsena, 1958, 183, 199-216)

TEXT: The author considers the first boundary value problem for the nonlinear elliptic equation $F(u_{xx}, u_{xy}, u_{yy}, x, y) = g(x,y)$ in the circle $D(x^2 + y^2 \leqq R^2)$ or in a bounded convex domain, the boundary of which is regular and possesses an essentially positive curvature. F is a polynomial of degree 2m + 1 relative to u_{xx}, u_{xy}, u_{yy} with coefficients from $C^{(3)}(D)$; $F(0,0,0,x,y) \equiv 0$. Just so it is demanded: $g(.,y) \in C^{(3)}(D)$. It is assumed that for F the condition of strong ellipticity is satisfied: $F_r \xi^2 + F_s \xi\eta + F_t \eta^2 \leqq \alpha_0 (\xi^2 + \eta^2)$ for every function $u(x,y) \in C^2(D)$; α_0 = const > 0

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does not depend on the choice of the function $u(x,y)$. The solubility of the first boundary value problem is asserted, if the highest terms of the polynomials F, F_x, F_s, F_t satisfy certain additional estimations. It is stated that the proof of the existence of the solution can be carried out according to the well-known method of continuation with respect to a parameter (S. N. Bernshteyn, Yu. Schauder and others), if at first certain necessary apriori estimations are obtained for the values of the solution and of its first and second derivatives. In the reviewed first part of the paper the author obtains the estimations of the values of the solution and of its first derivatives. As an example, satisfying all the requirements imposed by the author, the equation $(r+t)^3 - 3(rt - s^2)(r + t) + (r + t) = g(x, y)$ is given. The determination of a surface with respect to a given function $\Phi = R_1^3 + R_2^3 + R_1 + R_2$ of the principal radii of curvature R_1 and R_2 leads to an analogous equation.

[Abstracter's note: Complete translation.]

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16.3500, 16.2600

77798
SOV/42-15-1-5/27

AUTHOR: Bakel'man, I. Ya.

TITLE: On the Stability of Solutions of Monge-Ampere Equations of the Elliptic Type

PERIODICAL: Uspekhi matematicheskikh nauk, 1960, Vol 15, Nr 1, pp 163-170 (USSR)

ABSTRACT: The author derives estimates of solutions of the simplest Monge-Ampere equations:

$$\Gamma(z) \equiv z_{xx} z_{yy} - z_{xy}^2 = \varphi(x, y) \qquad (1)$$

as functions of $\varphi(x, y)$. Equation (1) is examined in a convex domain D bounded by a closed convex curve L; $\varphi(x, y)$ is assumed to be summable in D, and everywhere in D $\varphi(x, y) > 0$. These conditions imply that Eq. (1) is of elliptic type and that its solutions are convex functions. Let $z_1(x, y)$

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and $z_2(x, y)$ be twice continuously differentiable convex functions, convex on the axis z and coinciding on the boundary of D. Let $\varphi_1(x, y) = \Gamma(z_1)$, $\varphi_2(x, y) = \Gamma(z_2)$, then the functions $\varphi_1(x, y)$ and $\varphi_2(x, y)$ are continuous and non-negative in D. Let

$$\varphi^+(x, y) = \begin{cases} \varphi_2(x, y) - \varphi_1(x, y), & \text{if } \varphi_2 > \varphi_1, \\ 0, & \text{if } \varphi_2 \leq \varphi_1, \end{cases}$$

$$\varphi^-(x, y) = \begin{cases} \varphi_1(x, y) - \varphi_2(x, y), & \text{if } \varphi_1 > \varphi_2, \\ 0, & \text{if } \varphi_1 \leq \varphi_2. \end{cases}$$

The estimate:

$$-C(D)\sqrt{\iint_D \varphi^+(x, y)\,dx\,dy} \leq z_2 - z_1 \leq C(D)\sqrt{\iint_D \varphi^-(x, y)\,dx\,dy} \qquad (2)$$

where C(D) is a constant depending only on D, or if $z_1(x, y)$ and $z_2(x, y)$ are convex for $z > 0$, then

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$$C(D)\sqrt{\iint_D \varphi^+(x, y)\,dx\,dy} \geq z_2 - z_1 \geq -C(D)\sqrt{\iint_D \varphi^-(x, y)\,dx\,dy}. \quad (2')$$

is derived in another way. It was first published by Yu. A. Volkov in the journal, Vestnik LGU Nr 7 (1960). The estimate Eq. (2) follows directly from Theorem 1: Given two convex surfaces, Φ_1 and Φ_2, defined by the functions, $z_1(x, y)$ and $z_2(x, y)$, in bounded convex domain D, they have a common edge and are convex on one side. Consider the completely additive functions of the sets, $\omega^+(M)$ and $\omega^-(M)$, which represent the positive and negative parts, respectively, of the variation of the function of the set $\omega(\Phi_2, M) - \omega(\Phi_1, M)$. If Φ_1 and Φ_2 are convex on the side $z < 0$, then

$$C(D)\sqrt{\omega^+(D)} \geq z_2 - z_1 \geq -C(D)\sqrt{\omega^-(D)}. \quad (3)$$

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where C(D) is a constant depending on D and E is a Borel set in D. If $z_1(x, y)$ and $z_2(x, y)$ are convex on the side $z > 0$, then Eq. ([illegible]) becomes:

$$C(D)\,|\,\omega'(D) \leq z_2 - z_1 \leq c\,(D)\,|\,\omega\,(D) \qquad (6)$$

The author also considers the following equation:

$$F(z) = z_{xx} z_{yy} - z_{xy}^2 = \varphi(x, y) \cdot R(x, y, z) \qquad (7)$$

as a function of $\varphi(x, y)$. As before D is convex and $\varphi(x, y) \geqslant 0$, and is summable; $R(x, y, z)$ is assumed to be nonnegative, continuous in x and y in D and absolutely continuous as a function of z in every interval (α, β). Solutions of Eq.(7) will be convex and convexity is to be on the side $z < 0$. Furthermore, $R_z(x, y, z) \geqslant 0$ for $(x, y) \in D$ and almost all z. Theorem 2: Let $z_1(x, y)$ and $z_2(x, y)$ be

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On the Stability of Solutions of Monge-Ampere Equations of the Elliptic Type

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generalized solutions of Eq. (7) in the bounded convex domain D, convex on side $z<0$ and coinciding on boundary of D with convex curve L. Let

$$\Omega(D) = \iint_D |\varphi_2 - \varphi_1| \, dx \, dy,$$

$$R = \max \{\sup_D R(x, y, z_1(x, y)), \sup_D R(x, y, z_2(x, y))\}.$$

then

$$|z_2(x, y) - z_1(x, y)| < C(D) \sqrt{R\Omega(D)}.$$

In conclusion, the derived results are applied to the Minkowski problem. There are 4 Soviet references.

SUBMITTED: July 8, 1958

Card 5/5

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S/020/60/134/005/002/023
C111/C333

16.3500

AUTHOR: Bakel'man, I.Ya.

TITLE: The First Boundary Value Problem for Quasilinear Elliptic Equations

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 5, pp. 1005-1008

TEXT: Let Ω be a convex domain with the boundary Γ which is given by the three-times continuously differentiable functions $x=x(s)$, $y=y(s)$ and the curvature of which is $\geqslant \varkappa_0 = \text{const} > 0$. In $\Omega + \Gamma$ the author considers

(2) $A(x,y,p,q)r + 2B(x,y,p,q)s + C(x,y,p,q)t = D(x,y,z,p,q)$

and

(5) $A(x,y,z,p,q)r + 2B(x,y,z,p,q)s + C(x,y,z,p,q)t = D(x,y,z,p,q)$.

The functions A,B,C,D are continuously differentiable with respect to all variables; the first derivatives satisfy the Hölder condition with the exponent $0 < \beta \leqslant 1$ in $(x,y) \in \Omega + \Gamma$ and for all finite z,p,q. It is $|D(x,y,0,p,q)| \leqslant \varphi(x,y)R(\sqrt{p^2+q^2})$, where $\varphi \geqslant 0$ and $R > 0$ are continuous. With the aid of the function $\varphi(x,y)$ the author defines auxiliary

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C111/C333

The First Boundary Value Problem for Quasilinear Elliptic Equations

functions by a geometric construction. These are used for formulating additional conditions which must be satisfied by the coefficients A,B,C,D in order that the first boundary value problem for (2) be uniquely solvable (theorem 1 and 2) for vanishing boundary value conditions in the class of functions, the third derivatives of which satisfy in $\Omega + \Gamma$ the Hölder dondition with the exponents $0 < \beta' < \beta$, or in order that the first boundary value problem for (5) possesses at least one solution for vanishing boundary conditions in the same class. The theorems generalize the results of S.N.Bernshteyn (Ref. 1). For the proof of the theorems the author uses apriori-estimations of the solutions in C^1 and the topological principle of Schauder.

O.A.Ladyzhenskaya is mentioned in the paper. There are 4 references: 2 Soviet, 1 American and 1 German.

ASSOCIATION: Leningradskiy pedagogicheskiy institut imeni A.I.Gertsena (Leningrad Pedagogical Institute imeni A.I Gertsen)

PRESENTED: May 28, 1960, by V.I.Smirnov, Academician

SUBMITTED: May 17, 1960

Card 2/2

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S/020/61/137/005/001/026
C111/C222

16.3800

AUTHORS: Bakel'man, I.Ya., and Krasnosel'skiy, M.A.

TITLE: Non-trivial solutions of the Dirichlet problem for equations with the operator of Monge-Ampère

PERIODICAL: Akademiya nauk SSSR. Doklady, vol.137, no.5, 1961, 10..-1010

TEXT: The authors investigate non-negative solutions of

$$rt-s^2 = f(x,y,z,p,q)(1+p^2+q^2)^{\alpha}, \quad (1)$$

$$z(x,y)|_{\Gamma} = 0, \quad (2)$$

where $0 \leqslant \alpha \leqslant 1$, Γ -- boundary of the bounded convex region Ω and it has a specific curvature bounded from below by a positive number; $f(x,y,z,p,q)$ is continuous for $\{x,y\} \in \overline{\Omega}$, $z \geqslant 0$, $-\infty < p, q < \infty$, non-negative and for a z of an arbitrary finite interval it is uniformly bounded from above in the other variables. Every convex function $z(x,y)$ generates by its support planes $z-z(x_0,y_0) = p(x-x_0)+q(y-y_0)$ the so-called normal mapping of the points $\{x_0,y_0\} \in \overline{\Omega}$ into the p,q-plane. A solution of (1)-(2) is a non-negative convex function with an absolutely continuous area of the normal derivation if it almost everywhere

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APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000103110002-3"

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satisfies (1) and vanishes on Γ.
At first the authors consider

$$rt-s^2 = \varphi(x,y)(1+p^2+q^2)^{\alpha}, \quad z(x,y)\big|_{\Gamma} = 0. \tag{3}$$

Let $z(x,y) = A_{\alpha}\varphi(x,y)$.
Theorem 1: A_{α} transforms every uniformly bounded family of non-negative functions into a set which is compact in the sense of the uniform convergence. The operator A_{α} transforms every uniformly bounded and point-by-point convergent sequence of functions into a uniformly convergent sequence.
Theorem 2: A. The A_{α} are monotone, i.e. from $0 \leq \varphi(x,y) \leq \psi(x,y)$ it follows $A_{\alpha}\psi(x,y) \leqslant A_{\alpha}\psi(x,y)$.
B. For $0 \leqslant \alpha < 1$ for every non-negative $\varphi(x,y)$ it holds:

$$A_{\alpha}\left[\lambda\varphi(x,y)\right] \geqslant \lambda^{\frac{1}{2(1-\alpha)}} A_{\alpha}\varphi(x,y) \quad (0 \leq \lambda \leq 1). \tag{4}$$

C. If $\alpha_1 < \alpha_2$ then for every non-negative $\varphi(x,y)$ it holds:

$$A_{\alpha_1}\varphi(x,y) \leq A_{\alpha_2}\varphi(x,y).$$

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D) It holds

$$0 \leq A_\alpha \varphi(x,y) \leq \begin{cases} r_0 \sqrt{\left[(1-\alpha)\|\varphi\| r_0^2+1\right]^{\frac{1}{1-\alpha}}-1}, & \text{if } 0 \leq \alpha < 1, \\ r_0 \sqrt{e^{\|\varphi\| r_0^2}} & \text{if } \alpha = 1; \end{cases}$$

$$p^2+q^2 \leq \begin{cases} \left[(1-\alpha)\|\varphi\| r_0^2+1\right]^{\frac{\alpha}{1-\alpha}}-1 & \text{if } 0 \leq \alpha < 1, \\ e^{\|\varphi\| r_0^2}-1 & \text{if } \alpha = 1, \end{cases}$$

where p and q are the slopes of an arbitrary support plane of $A_\alpha \varphi(x,y)$; $1/r_0$ is the lower bound of the specific curvature of Γ.

The authors consider the operator

$$B\varphi(x,y) = A_\alpha f\left[x,y,\varphi(x,y),\frac{\partial}{\partial x}\varphi(x,y),\frac{\partial}{\partial y}\varphi(x,y)\right]. \qquad (5)$$

Theorem 3: The operator B lets invariant the cone of the non-negative convex functions which satisfy (2), and it is completely continuous on

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this cone (in the sense of the uniform metric).

Theorem 4: Let

$$f(x,y,z,p,q) \leq \begin{cases} a_1(1+z^2)^{\gamma} & \text{for } 0 \leq \alpha \leq 1, \\ a_1 \ln^{1-\varepsilon}(2+z) & \text{for } \alpha = 1, \end{cases} \qquad (6)$$

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where $\gamma < 1-\alpha$, $\varepsilon > 0$, $a_1 > 0$. Then (1)-(2) has at least one solution.

Theorem 5: Let (6) be satisfied and let exist a $\delta_0 > 0$ so that

$$f(x,y,z,p,q) \geqslant a_2 z^{2-\varepsilon} \quad (0 \leqslant z \leq \delta_0; \quad -\infty < p,\ q < \infty), \qquad (7)$$

where $a_2 > 0$, $\varepsilon > 0$. Then (1)-(2) has at least one solution which does not vanish identically.

Theorem 6: Let $f(x,y,z)$ be non-decreasing in z; $f(x,y,z) > 0$ for $z > 0$ and almost all $\{x,y\} \in \Omega$. Let

$$f(x,y,\lambda z) \geqslant \lambda^{r_0} f(x,y,z) \quad (\{x,y\} \in \Omega\ ;\ 0 \leqslant \lambda \leq 1;\ z \geqslant 0), \qquad (9)$$

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where $\gamma_0 < 2(1-\alpha)$. Then (1)-(2) cannot have more than one non-negative solution being not $\equiv 0$.

Theorem 7: Let exist $\delta_0 > 0$ and $M_0 > 0$ so that

$$f(x,y,z,p,q) \leq a_3 z^{\gamma_1} \quad (\{x,y\} \in \Omega \; ; \; 0 \leq z \leq \delta_0 ; \; -\infty < p, \; q < \infty); \qquad (10)$$

$$f(x,y,z,p,q) \geqslant a_4 z^{\gamma_1} \quad (\{x,y\} \in \Omega \; ; \; z \geqslant M_0 ; \; -\infty < p, \; q < \infty), \qquad (11)$$

where $\gamma_1 > 2$, $a_3, a_4 > 0$. Then (1)-(2) has at least one solution beside of the trivial one.

Theorem 8: Let exist a sequence $R_n \to \infty$, so that

$$f(x,y,z,p,q) > az^{\gamma_1} \quad (\delta R_n \leq z \leq R_n),$$

where $\gamma_1 > 2$ and $\delta > 0$ is sufficiently small. Let exist a sequence $R_n^* \to \infty$ so that

$$f(x,y,z,p,q) \leq a_n (1+z^2)^{\gamma_2} \quad (0 \leq z \leq R_n^*),$$

where $\gamma_2 < 1-\alpha$ and the a_n satisfy the condition

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$$r_o \sqrt{\left[(1-\alpha)a_n(1+R_n^{*2})^{\Gamma_2} r_o^2 + 1\right]^{\frac{1}{1-\alpha}} - 1} < R_n^* ,$$

where $1/r_o$ is the lower bound of the specific curvature of Γ. Then (1)-(2) has a countable set of different solutions z_n the maxima of which increase unboundedly for $n \to \infty$.

The theorems can be generalized to equations

$$\frac{rt-s^2}{(1+p^2+q^2)^{\alpha}} = E(x,y,z,p,q)r+2F(x,y,z,p,q)s + +G(x,y,z,p,q)t + f(x,y,z,p,q)$$

and

$$\frac{rt-s^2}{R(p,q)} = f(x,y,z,p,q),$$

where $R(p,q)$ is different from $(1+p^2+q^2)$ $(0 \leqslant \alpha \leqslant 1)$.

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There are 6 Soviet-bloc references.

ASSOCIATION: Voronezhskiy gosudarstvennyy universitet (Voronezh State University)

PRESENTED: November 23, 1960, by P.S.Aleksandrov, Academician

SUBMITTED: November 22, 1960

Card 7/7

BAKEL'MAN, I.Ya.; KRASNOSEL'SKIY, M.A.

Nontrivial solutions of Dirichlet problem for equations with Monge-Ampere operators. Dokl.AN SSSR 137 no.5:1007-1010 Ap '61. (MIRA 14:4)

1. Voronezhskiy gosudarstvennyy universitet. Predstavleno akademikom P.S.Aleksandrovym.
(Boundary value problems) (Operators (Mathematics))

BAKEL'MAN, I.Ya.

Generalized Chebyshev nets and manifolds of bounded curvature. Dokl. AN SSSR 138 no.3:506-507 My '61. (MIRA 14:5)

1. Leningradskiy gosudarstvennyy pedagogicheskiy institut im. A.I. Gertsena. Predstavleno akademikom V.I.Smirnovym.
(Chebyshev polynomials) (Functional analysis)

S/020/61/141/005/001/018
C111/C444

AUTHOR: Bakel'man, I. Ya.

TITLE: A variation problem connected with Monge-Ampère equation

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 5, 1961, 1011 - 1014

TEXT: As it is well known one can obtain the Monge-Ampère equation

$$u_{xx}u_{yy} - u_{xy}^2 = \psi(x, y) \qquad (1)$$

as the Euler equation for certain functionals. The author investigates those questions which are connected with the solutions of the variation problem for such functionals. Let Ω be a convex domain of the x,y-plane, its closed and smooth boundary Γ having the property that a tangent on Γ has only one point in common with Γ. Let C_h^+ be the set of the continuous non-negative functions u(x, y) which are defined in $\Omega + \Gamma$ and equal to the given continuous function h(X) on Γ. Let W_h^+ be the class of the convex functions, being equal to

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$h(X)$ on Γ and being convex in the direction of $z > 0$. Let be Z a cylinder with the directrix Γ and with generatrices, parallel to the z-axis. The function $h(X)$ defines a certain closed curve on Z. It divides Z into the lower domain Z_1 and the upper domain Z_2. Let be $\overline{u}(x, y) \in W_h^+$ the upper boundary of the convex closure of Z_1. Let be $\Phi_1(u) = \iint_\Omega u w(\overline{u}, de)$, $w(\overline{u}, e)$ being the area of the normal image of $\overline{u}(x, y)$. Let

$$\Phi_2(u) = -3\iint_\Omega u\mu(de), \quad I(u) = \Phi_1(u) - 3\iint_\Omega u\mu(de), \tag{5}$$

where $\mu(e)$ is a completely additive non-negative set-function, for which $\mu(\Omega) < +\infty$.

Theorem 1: For every $u \in C_h^+$ there is $\Phi_1(u) = \Phi_1(\overline{u})$, $\Phi_2(u) \geqslant \Phi_2(\overline{u})$ $I(u) \geqslant I(\overline{u})$. The functional $I(u)$ is discontinuous in the classes W_h^+ and C_h^+.

Let $\mathfrak{M}_\varepsilon$ be the set of all completely additive non-negative

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$\mu(e)$ with the property that $\mu(\Omega) < +\infty$ and $\mu(\Omega_\varepsilon) = 0$, Ω_ε being an open boundary stripe of Ω with the latitude ε. Let be $W^+_{h,\varepsilon}$ the set of all convex functions from W^+_h, for which $w(u, \Omega_\varepsilon) = 0$.

Then:

Theorem 2: If $\mu(e) \in \mathfrak{M}_\varepsilon$, then it is sufficient to search the function for which the functional $I(u)$ takes an absolute minimum, in the class $W^+_{h,\varepsilon}$.

Theorem 3: The class $W^+_{h,\varepsilon}$ is closed with respect to uniform convergence.

Theorem 4: $I(u)$ is continuous on $W^+_{h,\varepsilon}$.

Theorem 5: For every $u \in W^+_{h,\varepsilon}$, for which $\|u\|_C \geqslant 2\max h(X) \geqslant 0$, there hold the following estimations:

$$\Phi_1(u) \geqslant C_1 \varepsilon \|u\|_C (\|u\|_C - \max_\Gamma h(x))^2, \quad |\Phi_2(u)| \leqslant 3\|u\|_C \mu(\Omega),$$

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where the constant C_1 only depends on Ω. Let $u(x, y) \in W^{+}_{h,\varepsilon}$. Let be $\eta(x, y)$ a function, twice continuously differentiable in Ω, which vanishes in Ω_{ε}. Let $-1 < \alpha < +1$. Let $T(\alpha) = I(u + \alpha\eta)$.

Theorem 6: Under these suppositions there exists the derivative:

$$\left.\frac{dT}{d\alpha}\right|_{\alpha=0} = \lim_{\alpha\to 0} \frac{I(u+\alpha\eta) - I(u)}{\alpha},$$

with

$$\left.\frac{dT}{d\alpha}\right|_{\alpha=0} = 3\iint_{\Omega} \eta\left[w(u, de) - \mu(de)\right]$$

Theorem 7: In the class C^{+}_{h} there exists only one function, for which the functional $I(u)$ takes its absolute minimum. One supposes that $\mu(e) \in \mathfrak{M}_{\varepsilon}$. This function belongs to $W^{+}_{h,\varepsilon}$.

The results of this paper hold as well for the following functionals

$$I(u) = \int_{\Omega}\!\cdots\!\int u \det\left\|\frac{\partial^2 u}{\partial x_i \partial x_k}\right\| dx_1 \ldots dx_n - n\int_{\Omega}\!\cdots\!\int u\varphi\, dx_1 \ldots dx_n \qquad (10)$$

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A variation problem connected with...

There are 2 Soviet-bloc references and 1 non-Soviet-bloc reference.

ASSOCIATION: Leningradskiy gosudarstvennyy pedagogicheskiy institut im. A. I. Gertsena (Leningrad State Pedagogical Institute im. A. I. Gertsen)

PRESENTED: July 19, 1961, by V. I. Smirnov, Academician

SUBMITTED: July 13, 1961

Card 5/5

BAKEL'MAN, I.Ya.; KRASNOSEL'SKIY, M.A.

A criterion for the solvability of a two-point boundary problem [with summary in English]. Vest. LGU no.13:161-163 '61. (MIRA 14:7)

(Differential equations)

BAKEL'MAN, I.Ya.

Quasi-conical differential equations. Uch.zap.Ped.inst.Gerts. 218:49-75 '61. (MIRA 14:10)

(Differential equations)

APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000103110002-3"

BAKEL'MAN, I.Ya.

A variational problem related to the Monge-Ampere equation.
Uch.zap.Ped.inst.Gerts. 238:119-131 '62. (MIRA 16:4)
(Calculus of variations)

APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000103110002-3"

KRASNOSEL'SKIY, Mark Aleksandrovich. Prinimal uchastiye BAKEL'MAN, I.Ya.; GORYACHAYA, M.M., red.; LIKHACHEVA, L.V., tekhn. red.

[Positive solutions to operator equations in the theory of nonlinear analysis] Polozhitel'nye resheniia operatornykh uravnenii glavy nelineinogo analiza. Moskva, Gos.izd-vo fiziko-matem.lit-ry 1962. 394 p. (MIRA 15:7)

(Equations) (Operators (Mathematics))

S/020/63/148/002/001/037
B167/B112

AUTHORS: Bakel'man, I. Ya., Guberman, I. Ya.

TITLE: Dirichlet problem for an equation with Monge-Ampere operator

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 148, no. 2, 1963, 247-250

TEXT: Conditions are shown for which the Dirichlet problem for the differential equation

$$rt-s^2 = \varphi(x,y,z,p,q),\ \varphi \geqslant 0,\ z|_{\Gamma} = \psi(X)$$

has solutions in the generalized sense, with Γ being the boundary of the convex domain Ω, and X being a point on Γ. Let R(p,q) be a factor that compensates the increase in φ, and c_o and $\varkappa$ be positive constants, then

$$R(p,q) \leq c_o(1 + p^2 + q^2)^{\varkappa},\quad \varphi = R \cdot f$$

is assumed. The following assumptions are made for f: (1) f is continuous and non-negative in $0 \leq z < R_o$, $(x,y) \in \Omega$, $-\infty < p,q < \infty$; (2) for every $R \in [0,R_o)$, constants $a > 0$, $\lambda \geqslant 0$, $\varepsilon > 0$, $\nu > 0$ exist such that the
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APPROVED FOR RELEASE: 06/06/2000 CIA-RDP86-00513R000103110002-3"

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inequality $f(x,y,z,p,q) \leqslant a[\varrho(x,y)]^{\lambda}$ with arbitrary p,q and $z \in [0,R)$ holds for all points $(x,y) \in \Omega$ satisfying $\varrho(x,y) < \varepsilon$, ϱ = distance of the point (x,y) from Γ; $\varkappa \leqslant \frac{1}{\nu+2} + \frac{\lambda}{2}$; (3) for all $R \in [0,R_0)$, the condition $F(R) = \iint_{\Omega} f_R(x,y)dxdy < M(+\infty)$ is fulfilled, with $f_R(x,y) = \sup\limits_{\substack{0 \leqslant z \leqslant R \\ -\infty < p,q < +\infty}} f(x,y,z,p,q)$, $M(u) = \iint\limits_{p^2+q^2 \leqslant (\frac{u}{d})^2} \frac{dpdq}{R}$, with d being the diameter of Ω. If $\overline{W}^{+}_{\psi R}$ is the set of all functions defined in Ω and convex upward, whose boundary values are consistent with $\psi(X)$ and for which $z(x,y) \leqslant R$, then an operator B exists in $W^{+}_{\psi R}$ under the assumptions made on f. $Bz = A_R f$, if $A_R f$ is a solution to the boundary value problem. The operator B is totally continuous over the set $\overline{W}^{+}_{\psi R}$, $R \in [0,R_0)$. If a number $\widetilde{R}$ exists that satisfies the inequality

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$$\max_{\Gamma} \psi(x) \leqslant \tilde{R} < R_0, \; F(\tilde{R}) < M(\tilde{R} - \max_{\Gamma} \psi(x))$$

then the boundary value problem has solutions in $\overline{W}^{+}_{\psi R}$. Strongly elliptical equations with non-vanishing coefficient functions of the linear terms r,s,t may be treated similarly.

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PRESENTED: July 6, 1962, V. I. Smirnov, Academician

SUBMITTED: July 2, 1962

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ACCESSION NR: AP4002740 S/0199/63/004/006/1208/1220

AUTHOR: Bakel'man, I. Ya.; Guberman, I. Ya.

TITLE: Dirichlet problem for an equation with Monge-Ampere operator

SOURCE: Sibirskiy matemat. zhurnal, v. 4, no. 6, 1963, 1208-1220

TOPIC TAGS: Dirichlet boundary value problem, Monge-Ampere operator, Dirichlet problem solvability condition, convex surface convergence, convex surface existence condition, Dirichlet problem solution existence, continuous operator, Schauder fixed point principle

ABSTRACT: A brief review is given of some previous work done by one of the authors, I. Ya. Bakel'man, and by A. V. Pogorelov, on the Dirichlet problem for equations of the type

$$rt - s^2 = \varphi(x, y, z, p, q), \quad \varphi > 0, \qquad (1)$$

In the present study, the Dirichlet problem solvability conditions have been established for equation (1) when function φ is not growing faster than $(p^2+q^2)^k$ as p^2+q^2 goes to plus infinity, when k is an arbitrary positive constant, and when the specific curvature of Γ, the closed convex boundary curve of region Ω, is essentially positive and can become

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ACCESSION NR: AP4002740

zero. R (p, q) is defined as a positive, continuous function in the p, q plane. The existence of constants c_0 and k is assumed so that

$$R(p, q) < c_0(1 + p^2 + q^2)^k. \quad (2)$$

P is defined as a convex surface projecting uniquely into Ω, and $\omega_k(P, H)$ is its conditional curvature determined by the function R(p, q). Sufficient conditions are established for the existence of a convex surface P such that: (a) P projects uniquely into Ω; (b) $\omega_R(P, H)$ on Borel sets $H \subset \Omega$ is equal to a preset denumerably additive non-negative set function μ (H); (c) the boundary of P matches a preset continuous curve γ. The Dirichlet problem has been investigated for the equation:

$$rt - s^2 = R(p, q)\varphi(x, y). \quad (3)$$

with the boundary condition: $z|_\Gamma = L(x, y)$. (4)

in a convex region Ω bounded by a closed curve Γ. In addition to earlier assumptions about Γ and R(p, q), it is required that function φ (x, y) must be non-negative and summable over Ω, and that there must be constants $\lambda \geqslant 0$ and a > 0 such that, for points $(x, y) \in \Omega$, sufficiently close to Γ the inequality (5) is satisfied. The generalized solution

$$\varphi(x, y) \leqslant a\left[\delta(x, y)\right]^{\lambda} \quad (5)$$

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of (3) is a convex function z(x, y) in the region Ω, the graph of which satisfies the equation:

$$\omega_R(P, H) = \mu(H), \quad H \subset \Omega,$$

where $\mu(H) = \iint_H \varphi(x, y)\,dx\,dy.$ When the boundary of surface P matches the curve $\mathcal{L}$ determined by boundary condition (4), then the function z(x, y) is the generalized solution of the boundary value problem (3), (4). $w^+(w^-)$ is defined as the set of all functions defined in Ω, convex in the direction $z > 0$ $(z<0)$. The existence of the operator A_R is established, and of a sequence of functions $A_R\varphi_n$ which converges uniformly in Ω to $A_R\varphi_0$. Equation $z_0(x, y) = A_R\varphi_0$ is the solution of the boundary value problem (3), (4) in the class w+. Similarly, $A_R\varphi$ is determinable as the solution in the class w^-. The Dirichlet problem has also been investigated for the equation

$$rt - s^2 = g(x, y, z, p, q) \tag{6}$$

with the previous boundary condition (4). Equation (6) has been rewritten as:

$$rt - s^2 = R(p, q) \cdot f(x, y, z, p, q). \tag{7}$$

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The same assumptions are used for Ω and R(p, q). Additionally, it is assumed that the function f(x, y, z, p, q) is defined, continuous, and non-negative at

$$0 < z < R_0, \ (x, y) \in \Omega, \ -\infty < p, q < +\infty; \qquad (8)$$

and that constants $a > 0, \lambda \geqslant 0$ exist for each $R \in [0, R_0]$, so that for all points $(x, y) \in \Omega$, sufficiently close to Γ, the inequality $f(x, y, z, p, q) \leqslant a[\rho(x, y)]^{\lambda}$ is satisfied at arbitrary p, q and $z \in [0, R]$. With further assumptions, the existence of an operator B is established which is absolutely continuous on each set $\overline{W}_{L, R}$, $R \in [0, R_0]$ in the sense of uniform convergence. Consequently, the functions $B_{z_n} = A_R \Phi_{z_k}$ converge uniformly to $B_{z_0} = A_R \Phi z_0$.

The condition for the existence of a generalized solution of (6), (4) in $W^{+}_{L, R}$ is established with R satisfying the inequalities: $\max_{\Gamma} L(x, y) \leqslant R < R_0$ and $F(R) \leqslant M(R - \max L(x, y))$.

By applying the Schauder fixed-point principle, it is proved that $B_z = Z$ and the solutions

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ACCESSION NR: AP4002740

of the boundary value problem are equivalent. Orig. article has: 22 formulas.

ASSOCIATION: None

SUBMITTED: 10Jul62 DATE ACQ: 31Dec63 ENCL: 00

SUB CODE: MM NO REF SOV: 003 OTHER: 000

Card 5/5

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